AMMP CENTRE

BULLETIN

A monthly bulletin of Advanced Manufacturing and Material Processing & Zecttron Sdn Bhd

Conducting World Class Research

February 2015 Issue 15

AMMP Centre Hosted Two Visiting Professors in January 2015

January 2015 - Professor Dr. Dinesh K Agrawal from Pennsylvania State University (PennState), United States and Professor Dr. Majid Reza Ayatollahi from Iran University of Science and Technology (IUST) , Iran were two visiting professors hosted by AMMP Centre early this year.

Professor Agrawal delivered a lecture on Development of Microwave Sintering on January 7th as part of his stay in AMMP from January 3 - 9. Professor Agrawal is currently Professor of Materials and Engineering Science & Mechanics and also Director of Microwave Processing and Engineering Center.

Meanwhile, Professor Dr. Majid Reza Ayatollahi visited AMMP from January 13 - 15 and has delivered a lecture on nano-indentation, a technique that has garnered a lot of attention in recent years to measure mechanical properties of different engineering materials. Professor Ayatollahi is the Director at Fatigue and Fracture Research Laboratory, School of Mechanical Engineering, IUST.

University Start-Up Conference (U-Start 2015)

20 – 21 January 2015 – Zecttron Sdn Bhd has participated in the University Start-Up Conference (U-Start 2015) held by University of Malaya Centre of Innovation and Commercialization (UMCIC). The event held in Pullman Kuala Lumpur Bangsar Hotel was themed "Creating Economic and Social Impact Through University Start-Ups" for the year.

Zecttron Sdn Bhd was a part of commercialisation success stories showcase in the conference owing to its success to bring up to RM 1 million to University of Malaya. Professor Dr. Mohd Hamdi Abd Shukor was also invited as a panelist in one of the sessions on "The University Start-Up as a game changer in technology transfer from Universities".

U-Start 2015, first of its kind in the region, had five sessions and three plenary talks covering pitching, crowdsourcing, intellectual property and investment. The conference was officiated by the guest of honor Tan Sri Dr Mohd Irwan Siregar Abdullah, Sec Gen of Treasury Malaysia who is also the Chairman/Founder of Malaysian Global Innovation and Creativity Centre (MaGIC).

Built and Delivered ! CNC Lathe Machine

12 January 2015 – Zecttron Sdn Bhd had successfully installed a CNC Lathe Machine in the Sungai Buloh Vocational School following two years of discussions and development. The machine, Zecttron UML-V2 was equipped with a SIEMENS controller and 8-tool automatic tool changer with an improved design color coated steel casing, as compared to its predecessor UML-V1.

The machine will be used by teachers and students as part of the their lessons which will cover machine code programming and computer aided design. Previously, UML-V1 which has been hailed as the first Malaysian-made CNC Lathe was developed in 2012.

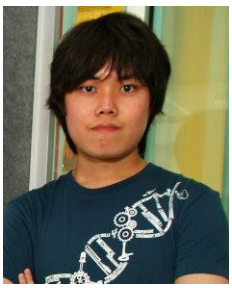
News in Pictures

APPRECIATION - Dr Sayuti represented Zecttron to present a mock cheque to UMCIC in the recent U-Start 2015 Conference.

RESEARCH VISIT - A team from AMMP Centre, comprising of Dr Farazila Yusof, Dr Reza Mahmoodian, Mr Fadzil Jamaludin and Mr Raza Moshwan, spent a week in Joining and Welding Research Institute (JWRI), Osaka University in November 2014 as part of the MOA signed between JWRI and AMMP on collaborative research.

Research Highlights

Effects of Conventional and Two-Step Sintering on the Properties of Hydroxyapatite

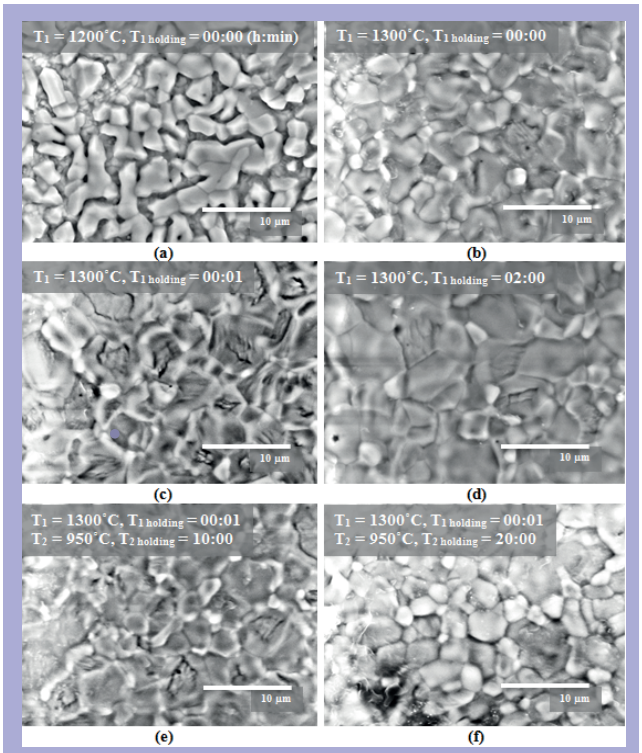


By Edward CJ Gan

While hydroxyapatite has shown great promise as an implant material, its load-bearing applications are restricted due to its inherently poor mechanical properties. One of the main reasons is due to the occurrence of detrimental grain growth of hydroxyapatite during the sintering process. Generally, grain growth coincides with the deterioration of mechanical properties.

An alternative consolidation method using two-step sintering has shown to successfully control the grain growth. However, up to now, only limited understanding in its effectiveness according to sintering settings (e.g. different combinations of temperatures T1 and T2) and minimal work to observe the evolution of hydroxyapatite properties throughout the consolidation process have been accomplished. These are the aims of the present study.

In this work, hydroxyapatite was synthesised using the wet precipitation method. The obtained powder was evaluated thereafter in terms of phase characterisation, morphology, and properties determination. After powder pressing (i.e. uniaxial and cold isostatic pressing), a preliminary study was performed where various sintering profiles for the conventional and two-step sintering methods were used to sinter the hydroxyapatite compacts. The sintered samples were studied in terms of phase stability, relative density, grain size, Vickers hardness, and fracture toughness. The results revealed that two-step sintering was effective in suppressing grain coarsening when compared to conventional sintering. Also, it was found that the sintering temperature, T1 rather than soaking temperature, T2 at which densification occurs plays a major role in determining the mechanical properties of hydroxyapatite samples. It was concluded that sintering, T1 and soaking temperatures, T2 at 1300˚C and 950˚C, respectively were found to be most suitable for obtaining hydroxyapatite with good mechanical properties.



SEM MICROGRAPHS observing the microstructure development of HA at various sintering profiles for (a) - (d) conventional sintering and (e) - (f) two step sintering.

Hence, at those temperatures, an optimisation study was carried out to observe the evolution of hydroxyapatite properties at different stages of consolidation when heated with conventional and two-step sintering. It was revealed that sintering temperature, T1 had a significant impact on the properties of hydroxyapatite whilst the sintering duration had a minor role in controlling the characteristics of hydroxyapatite. For example, no improvements according to sintering duration were found in relative density and Young's modulus.

However, a gradual but steady improvement in Vickers hardness according to sintering duration was recorded with both conventional and two-step sintering. However, while this observation was noted with fracture toughness for the two-step sintering (with increasing sintering duration), no improvements were observed with conventional sintering. This phenomenon was attributed to the much faster rate of grain growth experienced with the latter.

This research has concluded that given the grain growth suppression abilities demonstrated with two-step sintering, it has the potential to improve the mechanical properties of hydroxyapatite over a longer sustained period of sintering duration or higher temperature, T1.

CNC Machining Fundamentals Training

22 - 30 January 2015 – Zecttron organized three (3) days of training at Sungai Buloh Vocational College. Participants learned first hand from the recently delivered CNC Lathe Machine built by Zecttron, and from the lectures delivered by the instructor. All the participants have the opportunity to work directly on the CNC Lathe machine under supervision of the instructor. Participants were trained on how to write CNC program, operate a CNC Lathe machine and test run the program on a CNC Lathe machine.

TRAINING - Participants in one of the sessions

Achievements

Toray Science and Technology Award 2014

Congratulations to Professor Ir. Dr. Ramesh Singh and Professor Dr. Hamdi Abd Shukor (co-winner) for being one of the recipients of the MTSF Toray Science and Technology Award. Malaysian Toray Science Foundation (MTSF) conferres 2 awards of RM30,000 every year to Malaysian scientists in recognition of his/her outstanding achievements and contributions in Science and Technology.